

CLAIMS:

1. **Apparatus** for refilling a printer cartridge, said apparatus comprising
a dock for a printer cartridge,
a dock for an ink replenishment cartridge and a flow system including a
5 pump, valving and conduiting,
wherein, in use, said flow system selectively interconnects with said
conduiting at least one of a docked said printer cartridge and a docked said ink
replenishment cartridge,
wherein there is, in addition, an ink receiver or the ink replenishment
10 cartridge, when docked, to provide an ink receiver,
and wherein the flow system is operable in each of the following modes:
 - (a) a draw off mode with the pump operating in a first direction to
take ink from within a docked printer cartridge into the ink receiver,
 - (b) an ink supply mode with the pump operating in a second direction
15 to supply ink from within a docked ink replenishment cartridge into a
dock printer cartridge, and
 - (c) an ink re-routing mode with the pump operating in the second
direction to reroute ink taken into the flow system from within a
dock ink replenishment cartridge in mode (b) operation, such
20 rerouting being to at least one of:
 - (1) cycle ink in the conduiting when over a threshold pressure; and
 - (2) discharge ink to the ink receiver when over a threshold pressure.
2. Apparatus of claim 1 wherein the flow system is subject to, at least in part,
25 electrical control of at least one of the pump and said valving of at least one
conduit of the conduiting after being initiated wherein the flow system
 - (i) selectively operates in mode (a) and then
 - (ii) while having at least the possibility of acting wholly or in part in mode
 - (c), selectively operates in mode (b).

3. Apparatus as claimed in claim 1 or 2 wherein said flow system is operable in a further mode, mode (d), whereby there is a draw off of fluid from within a mode (b) filled or partially filled docked printer cartridge.

5 4. Apparatus of claim 3 wherein there is a programmed or electronic control of at least one of the pump and said valving of at least one conduit of the conduiting wherein the flow system iterates the sequence of
(I) mode (b) alone, or both modes (b) and (c), and
(II) mode (d).

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5. Apparatus as claimed of claim 1 wherein the flow system includes an electrically controlled pump capable of operating in two directions.

15 6. Apparatus of claim 1 wherein the pump and valving in the flow system prevents any substantial reverse flow of ink to the flow direction(s) in mode (b) yet will allow for ink within part of the flow system and, if above a threshold pressure, at least some routing of ink to the ink receiver.

20 7. Apparatus as claimed in claim 1 wherein the flow system in mode (b) filters the ink supply prior to its passage into a docked printer cartridge.

25 8. Apparatus as claimed in claim 1 wherein there is an electronic control of the flow system mode responsive to sensors capable of detecting at least one of the presence of a docked printer cartridge,
the presence of an ink replenishment cartridge,
the status of a docked printer cartridge,
the status of a docked ink replenishment cartridge,
ink status in the flow system,
the integrity of the flow system, and
30 the integrity of the flow system relationship with at least one of the printer cartridge, the ink replenishment cartridge and the ink receiver.

9. Apparatus as claimed in claim 1 wherein said ink replenishment cartridge is docked in the dock therefor and said ink replenishment cartridge includes said ink receiver.

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10. Apparatus as claimed in claim 9 wherein said flow system is connected to at least one of the ink replenishment cartridge, the ink receiver and the printer cartridge by a cannula.

10 11. **In combination,**

(A) **Apparatus** for refilling a printer cartridge, said apparatus having a dock for a printer cartridge,

a dock for an ink replenishment cartridge, and a flow system including a pump, valving and conduiting,

15 **wherein**, in use, said flow system can interconnect with its said conduiting at least a docked said printer cartridge and a docked said ink replenishment cartridge,

wherein there is, in addition, an ink receiver or the ink replenishment cartridge, when docked, is to provide an ink receiver,

20 **and wherein** the flow system is operable in each of the following modes in use:

(a) a draw off mode with the pump operating in a first direction to take ink from within a docked printer cartridge into the ink receiver,

(b) an ink supply mode with the pump operating in a second direction to supply ink from within a docked ink replenishment cartridge into a docked printer cartridge, and

(c) an ink re-routing mode with the pump operating in the second direction to reroute ink taken into the flow system from within a docked ink replenishment cartridge in mode (b) operation, such rerouting being to at least one of:

30 (1) cycle ink in the conduiting when over a threshold pressure; and

(2) discharge ink to the ink receiver when over a threshold pressure

and (B) at least one of

a dockable printer cartridge, and

5 a dockable ink replenishment cartridge.

12. A combination of claim 11 wherein said ink replenishment cartridge includes
said ink receiver.

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13. A combination of claim 11 or 12 wherein a docking cannula connects to
the flow system.

14. **A method of refilling a printer cartridge** which comprises

15 (I) connecting all of

- (1) the ink supply reservoir of an ink replenishment cartridge,
- (2) the ink reservoir of a printer cartridge, and
- (3) an ink receiver into a connecting flow system, and,

(II) using the flow system,

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(a) drawing off at least some of any ink from within the ink reservoir
of the printer cartridge and passing that fluid into the ink receiver,

(b) supplying ink from the ink supply reservoir of the ink
replenishment cartridge into the ink reservoir of the printer cartridge, and

(c) halting the at least net feeding of ink from the flow system into the
25 ink reservoir of the printer cartridge if at least one of

(i) the ink replenishment cartridge is empty of ink, and

(ii) the ink reservoir of the printer cartridge is full of ink,

such halting of the supply of ink, if the ink reservoir of the printer cartridge is
full, involving diverting or cycling in the flow system, ink already taken from within
30 the ink replenishment cartridge.

15. A method of claim 14 wherein step (a) and step (b) require opposite rotation of a pump in said flow system.

16. A method as claimed in claim 14 or 15 wherein, as a step (d), there is a
5 relieving of pressure from within the ink reservoir of the filled printer cartridge by drawing off some fluid therefrom into the flow system.

17. A method as claimed in claim 14 wherein said flow system docks to at least the ink replenishment cartridge using at least one cannula.

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18. A printer cartridge refilled at least in part by a **method of refilling a printer cartridge** which comprises

- (I) connecting all of
 - (1) the ink supply reservoir of an ink replenishment cartridge,
 - (2) the ink reservoir of a printer cartridge, and
 - (3) an ink receiver into a connecting flow system, and,
 - (II) using the flow system,
 - (a) drawing off at least some of any ink from within the ink reservoir of the printer cartridge and passing that fluid into the ink receiver,
 - (b) supplying ink from the ink supply reservoir of the ink replenishment cartridge into the ink reservoir of the printer cartridge, and
 - (c) halting the at least net feeding of ink from the flow system into the ink reservoir of the printer cartridge if at least one of
 - (i) the ink replenishment cartridge is empty of ink and
 - (ii) the ink reservoir of the printer cartridge is full of ink,
- 20 such halting of the supply of ink, in the eventuality that the ink reservoir of the printer cartridge is full, involving diverting or cycling in the flow system, ink already taken from within the ink replenishment cartridge.
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